

REMARKS/ARGUMENTS

Claim 6 is canceled.

Claims 1-5 and 7-13 are pending.

Applicants thank Examiner Ahmed for the helpful and courteous discussion of September 15, 2006, where differences in the process claims of the invention and the processes of the cited references were discussed; namely that the cited references do not suggest the sequential steps of raising the concentration of phosphoric acid after adding water and removing silicon, as found in the present claims. Examiner Ahmed indicated a willingness to reconsider the rejections in light of the Applicants arguments, supported by an inventor's declaration.

Favorable reconsideration of the claims is respectfully requested.

Applicants respectfully traverse the obviousness rejection of Claims 1-5, 7-8, and 10-13 as being unpatentable over Yokomizo in view of Kaji.

Applicants respectfully submit that the Office has mischaracterized Yokomizo, and that Yokomizo does not describe or suggest the process as described in the present claims. Claim 1 of the instant invention describes a regeneration process of an etching solution employing the steps of

- 1) taking out the etching solution from the etch bath;
- 2) adding water to the taken-out etching solution to lower the phosphoric acid concentration in the solution to 50-80 wt% and to precipitate a silicon compound contained therein;
- 3) removing the silicon compound from the taken-out etching solution; and
- 4) raising the concentration of phosphoric acid in said taken-out etching solution to 80-90 wt%. The process is shown graphically below:

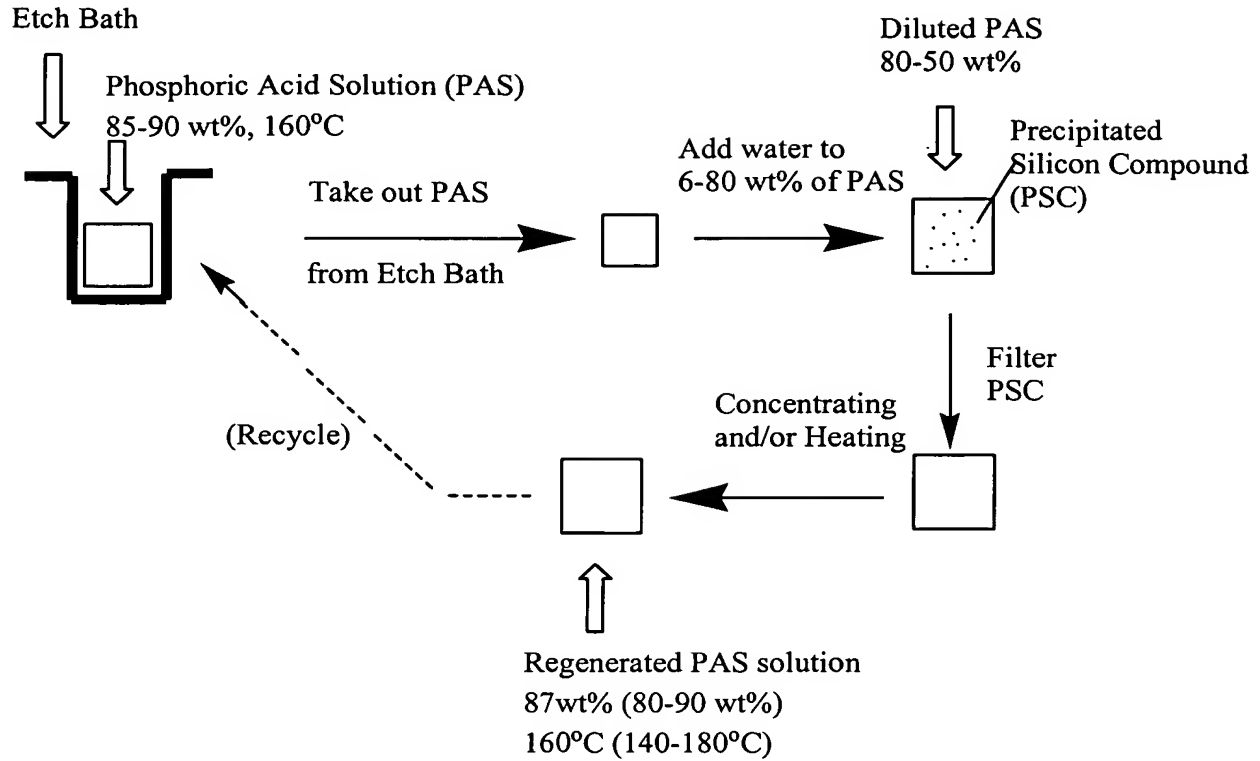


Figure 1

In the process of Claim 1, after the PAS solution, which is 85-90 wt% and 160°C as shown in the present specification at paragraphs [0021] and [0022], is taken out from the bath, it is diluted with water, thus lowering the concentration of phosphoric acid in the solution to 50-80 wt%. This dilution has the effect of precipitating out undesired silicon compounds (as shown in Figure 1 by the appearance of particles in the solution after water is added). The particles are then removed (for example, by filtration), and then the concentration of phosphoric acid in the solution is raised to 80-90 wt% by concentrating and/or heating. The dotted line in Figure 1 shows the solution can then be recycled into the etch bath, if desired. Therefore, the amount of water necessary is an amount which is enough to lower the solubility of the silicon compounds and precipitate them in large quantities. The amount is 6-80 wt% of phosphoric acid solution.

The concentration of phosphoric acid in the solution over time for the process of Claim 1 thus has the curve shape shown in Figure 2.

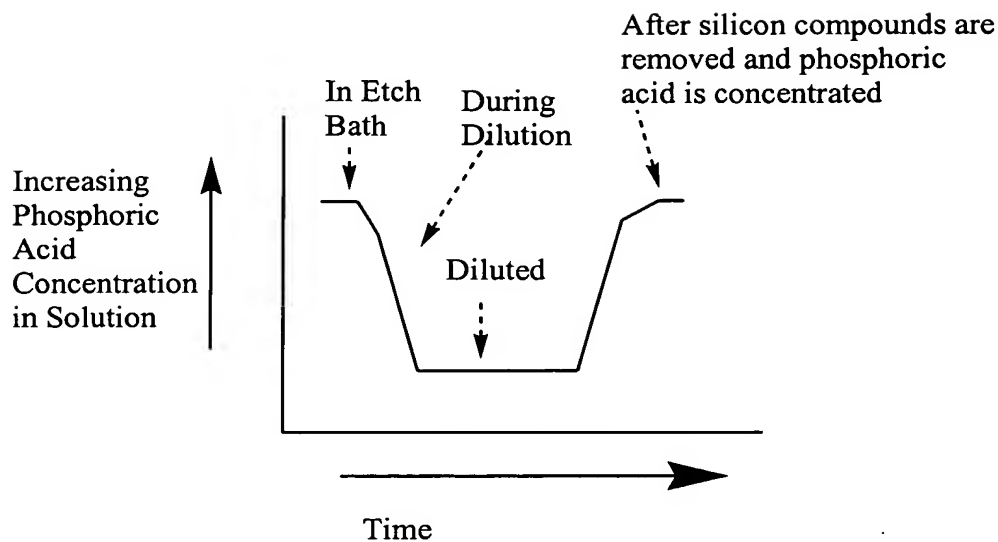


Figure 2

In contrast to the instant invention, the process of Yokomizo is shown in Figure 3.

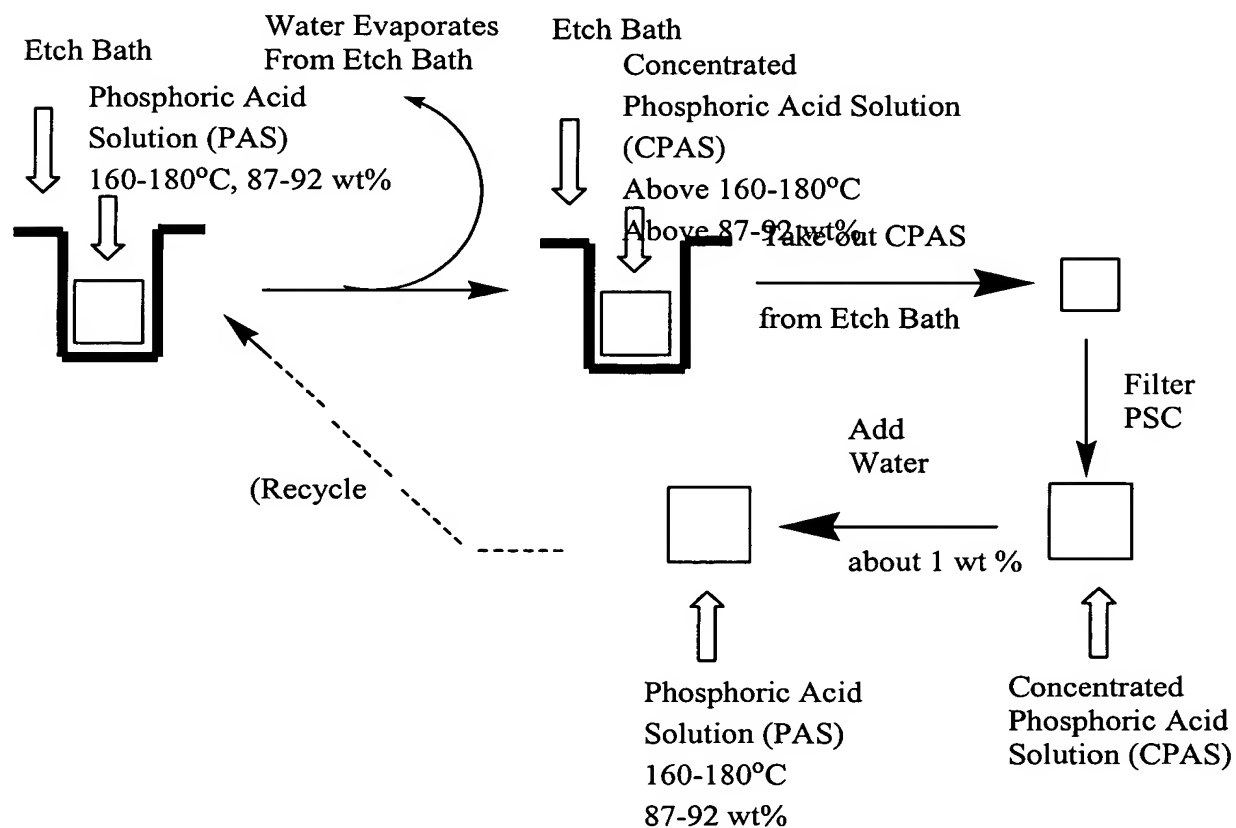


Figure 3

Yokomizo, at column 6, lines 12-20, describes that the phosphoric acid solution in the etching bath is always boiling, and that over time, the moisture (water) in the solution

evaporates, so that the temperature is then increased to maintain boiling. Thus, the etching solution of Yokomizo starts out at a certain phosphoric acid concentration and, over time, as water evaporates from the solution, the phosphoric acid in the solution becomes more concentrated.

Yokomizo, at column 1, lines 20-22, and again at 27-28, describes that the boiling phosphoric acid solution has a boiling point of 160-180°C, which is the “designated temperature” of column 6, line 42. As shown in the inventor’s declaration submitted along with this paper, a phosphoric acid solution with a boiling point of 160-180°C has a phosphoric acid concentration of approximately 87-92 wt% phosphoric acid. As described above, as water boils off, this phosphoric acid concentration increases above the 87-92 wt% phosphoric acid range. Therefore, the amount of water added is ONLY the amount evaporated, about 1 wt% of the etching solution; which is an extremely small amount.

In the process of Yokomizo, some of this concentrated phosphoric acid solution is taken out from the etch bath and enters a circulation line, it is moved through a pump, filtered, its temperature is adjusted, water is then added, and then the solution is reintroduced into the etch bath (please see Figure 1 and column 4, lines 12-36).

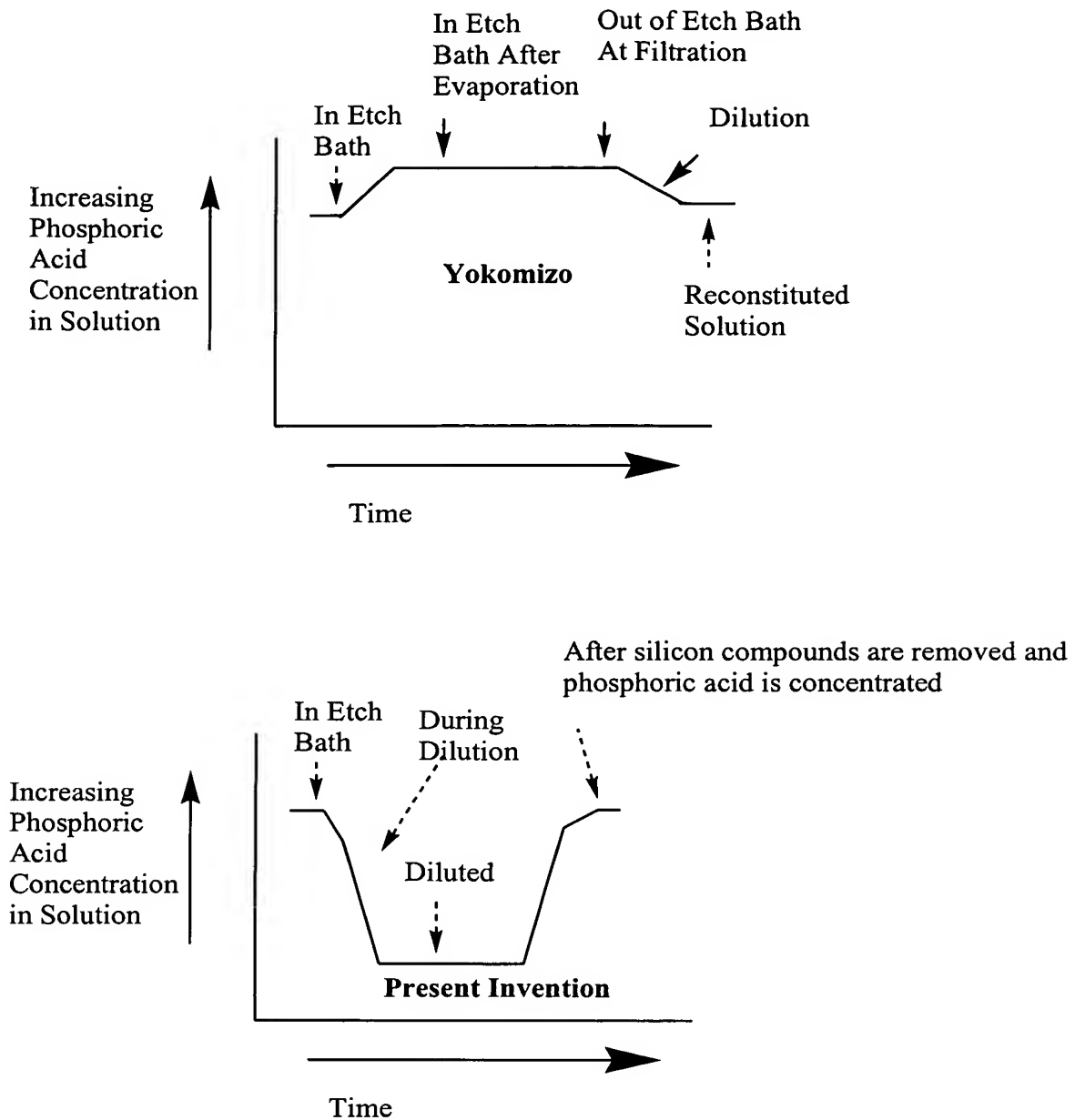
Thus, the present invention takes a phosphoric acid solution, dilutes it with water so that the concentration of phosphoric acid in the solution drops to 50-80 wt%, filters the solution, and then reconcentrates the solution, for example to a phosphoric acid concentration as high as 90 wt%.

In contrast, Yokomizo adds a little amount of water (for example 1 wt%), for bringing the phosphoric acid concentration in the solution back to its original value (for example, to 92 wt%), and filters the solution.

Thus the amounts of water added are different (i.e., Yokomizo is very little), the point where filtration occurs is different (i.e., after adding water in the instant invention, before the

addition of water in Yokomizo), the amounts of additional water added are different (i.e., in the middle of the process of the instant invention, at the end of the process of Yokomizo), and the amounts of water are different (6-80 wt% vs. 1 wt%) for the present invention and Yokomizo. Finally, the present invention raises the concentration of phosphoric acid up to 80-90 wt% by concentrating and/or heating to regenerate the solution, and this step is not described in Yokomizo.

The phosphoric acid concentration / time curves for Yokomizo and the instant invention are shown below. These curves visually demonstrate the differences between Yokomizo and the present invention, as Yokomizo's concentration / time curve is "hill" shaped whereas the present invention's curve is "trough" shaped.



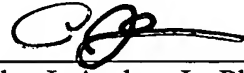
Accordingly, Yokomizo does not suggest or describe all of the limitations of the instant process. Further, Kaji, in describing that the boiling point of a phosphoric acid solution increases with increasing phosphoric acid concentration, does not remedy the defects of Yokomizo. Accordingly, Applicants respectfully request withdrawal of the rejection.

Applicants submit the present application is now in condition for allowance. Early notification to this effect is earnestly solicited.

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Respectfully submitted,

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